

REMARKS

Reconsideration of the Official Action dated September 26, 2001 is respectfully requested for the following reasons. Prior to discussing the various issues raised in the Official Action, it should be noted that the amendments to Claim 19 are for clarification purposes and are not intended to narrow the scope of the claim.

Claims 1-4 and 7-11 were rejected under 35 U.S.C. §102(e) as allegedly being anticipated by U.S. Patent No. 6,123,775 ("Hao"). The reasons for the rejection are set forth in numbered paragraph 2, on page 2 of the Official Action. This rejection is respectfully traversed for the following reasons.

Claim 1 sets forth a shower head electrode for use in a plasma reaction chamber, said electrode comprising a central portion, a plurality of gas outlets in the central portion of the electrode through which process gas can be delivered from an exposed surface of the electrode, and a step projecting from the exposed surface of the electrode, the step being located at a peripheral portion of the electrode and extending at least partially around the central portion of the electrode, the step controlling a localized density of the plasma formed adjacent the exposed surface of the electrode. The combinations of features recited in Claim 1 and in the claims dependent thereon are not disclosed by Hao.

In the Official Action, Hao is cited for a disclosure of a showerhead electrode having a "step projecting from the exposed surface of the electrode" with element 36 in FIG. 4a being identified as the "step" (Official Action at page 2). Element 36, however, is a heat transfer member located within a gas distribution chamber defined between a showerhead electrode 20 and a support member 22 (see column 5, lines 8-14 of Hao). In

the arrangement shown in Hao, the heat transfer member 36 is on a portion of the showerhead electrode 20 which is not exposed to the plasma environment of a plasma reaction chamber. Instead, the heat transfer member 36 is in contact with the back surface of the showerhead electrode, i.e., the surface of the showerhead electrode which is not exposed. Accordingly, it is submitted that Claim 1 and the claims dependent thereon are clearly patentable over Hao.

Claims 5 and 6 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Hao. The reasons for the rejection are set forth in numbered paragraph 4, on page 3 of the Official Action. This rejection is respectfully traversed for the following reasons.

Claims 5 and 6 depend indirectly from Claim 1 and thus are patentable over Hao for at least the reasons that Claim 1 is patentable thereover. Further, the position taken in the Official Action that the feature of Claim 5 (that the inner surface of the step forms an obtuse angle with respect to the substantially planar central portion of the electrode) is "an obvious design choice" is respectfully traversed. As shown in Hao, the heat transfer member 36 is on a portion of the showerhead electrode 20 which is not exposed to the interior of a plasma reaction chamber. Thus, not only does Hao not disclose a stepped electrode as claimed but further, it clearly would not have been obvious to a person of ordinary skill in the art to provide the claimed feature of a step forming an obtuse angle. Accordingly, Claims 5 and 6 are clearly patentable over Hao.

Claims 19-31 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Hao and further in view of U.S. Patent No. 5,779,803 ("Kurono"). The

reasons for the rejection are set forth in numbered paragraph 5, on page 3 of the Official Action. This rejection is respectfully traversed for the following reasons.

Claim 19 sets forth a plasma chamber for use in manufacturing a semiconductor device, said plasma chamber including a top electrode and a bottom electrode having opposed surfaces facing each other and spaced apart from one another to define a gap therebetween, the bottom electrode comprising a substrate support, and the opposed surface of the top electrode being an exposed surface comprising a central portion and a step projecting towards the bottom electrode of the top electrode, the step controlling a localized density of the plasma formed adjacent the exposed surface of the top electrode. The combinations of features recited in Claim 19 and in the claims dependent thereon are not suggested by the combination of Hao and Kurono.

In the rejection, Kurono is cited for disclosure of a plasma etching apparatus with an edge ring and it is alleged that it would have been obvious to incorporate the showerhead electrode of Hao in a plasma apparatus as described by Kurono (Official Action at page 3). Claim 19 specifically recites that a plasma chamber includes top and bottom electrodes facing each other with the top electrode having an exposed surface comprising a central portion and a step projecting towards the bottom electrode from a peripheral portion of the top electrode, the step extending at least partially around the central portion and being effective to control a localized density of the plasma formed adjacent the exposed surface of the top electrode. As explained earlier, the heat transfer member 36 of Hao is located on the back side of the showerhead electrode 20 and thus is not on the exposed surface thereof. Given this deficiency of Hao, any combination of Hao with Kurono cannot possibly

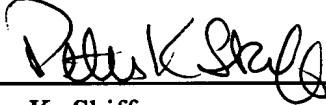
produce the combination of features recited in Claim 19. Accordingly, Claims 19-31 are clearly patentable over the combination of Hao and Kurono.

It is submitted that the differences between the claimed subject matter and the prior art are such that the claimed subject matter, as a whole, would not have been obvious at the time the invention was made to a person having ordinary skill in the art.

In view of the foregoing, it is submitted that the present application is in condition for allowance and such action is earnestly solicited.

Respectfully submitted,

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Date: December 18, 2001

Attachment to AMENDMENT dated December 17, 2001

Marked-up Claim 19

19. (Amended) A plasma chamber for use in manufacturing a semiconductor device, said plasma chamber including a top electrode and a bottom electrode having opposed [respective] surfaces facing each other and spaced apart from one another to define a gap therebetween, the bottom electrode comprising a substrate support, and the opposed surface of the top electrode being [having] an exposed surface comprising a central portion and a step projecting from a peripheral portion thereof and extending at least partially around the central portion, the step controlling a localized density of the plasma formed adjacent the exposed surface of the top electrode.